Leica Z6 APO
Leica Z16 APO
User Manual

Leica
MICROSYSTEMS

General Instructions

Safety Concept

Before using your macroscope for the first time, please read the "Safety Concept" brochure included with your instrument. It contains additional information about handling and care.

Use in clean rooms

The Leica Z series can be used in clean rooms without any problems.

Cleaning

★ Do not use any unsuitable cleaning agents, chemicals or techniques for cleaning.

★ Never use chemicals to clean colored surfaces or accessories with rubberized parts. This could damage the surfaces, and specimens could be contaminated by abraded particles.

★ In most cases, we can provide special solutions on request. Some products can be modified, and we can offer other accessories for use in clean rooms.

Servicing

★ Repairs may only be carried out by Leica Microsystems-trained service technicians. Only original Leica Microsystems spare parts may be used.

Responsibilities of person in charge of instrument

★ Ensure that the Leica macroscope is operated, maintained and repaired by authorized and trained personnel only.

Important Safety Notes

User Manual

The individual modules of the Leica Z series include an interactive CD-ROM with all relevant user manuals in other languages. Keep it in a safe place, and readily accessible to the user. User manuals and updates are also available for you to download and print from our web site www.leica-microsystems.com.

This User Manual describes the special functions of the individual modules of the Leica Z series and contains important instructions for their operational safety, maintenance, and accessories.

The "Safety Concept" booklet contains additional safety information regarding the service work, requirements and the handling of the macroscope, accessories and electrical accessories as well as general safety instructions.

You can combine individual system articles with articles from external suppliers (e.g. cold light sources, etc.). Please read the user manual and the safety requirements of the supplier.

Before installing, operating or using the instruments, it is mandatory to read the user manuals listed above. In particular, please observe all safety instructions.

To maintain the unit in its original condition and to ensure safe operation, the user must follow the instructions and warnings contained in these user manuals.

Symbols Used

Warning of a danger

This symbol indicates especially important information that must be read and complied with.

Failure to comply can cause the following:

- ★ Hazards to personnel
- ★ Functional disturbances or damaged instruments

Warning of hazardous electrical voltage

This symbol indicates especially important information that is mandatory to read and observe.

Failure to comply can cause the following:

- ★ Hazards to personnel
- ★ Functional disturbances or damaged instruments

Danger due to hot surface

This symbol warns against touching accessible hot surfaces, e.g. those of light bulbs.

Important information

This symbol indicates additional information or explanations that intend to provide clarity.

Explanatory notes

- ★ This symbol within the text stands for additional information and explanations.

Figures

(1) Numbers in parentheses within the descriptions relate to the figures and the items within those figures.

Safety Instructions

Description

★ The individual modules fulfill the highest requirements for observation and documentation with the Leica Z series.

Intended use

★ Refer to "Safety Concept" booklet.

Non-intended use

★ Refer to "Safety Concept" booklet.

Never use Z series macroscopes or their components for surgical procedures (for example, on the eye) unless they are specifically intended for that purpose.

The instruments and accessories described in this operating manual have been tested for safety and potential hazards. The responsible Leica affiliate must be consulted whenever the instrument is altered, modified or used in conjunction with non-Leica components that are outside of the scope of this manual.

Unauthorized alterations to the instrument or noncompliant use shall void all rights to any warranty claims.

Place of use

★ Refer to "Safety Concept" booklet.

★ Electrical components must be placed at least 10 cm away from the wall and from flammable substances.

★ Avoid large temperature fluctuations, direct sunlight and vibrations. These conditions can distort measurements and micrographic images.

★ In warm and warm-damp climatic zones, the individual components require special care in order to prevent the build-up of fungus.

Safety Instructions (cont'd.)

Responsibilities of person in charge of instrument

★ Refer to "Safety Concept" booklet.

Ensure that:

★ The Z series macroscopes and accessories are operated, maintained and repaired by authorized and trained personnel only.

★ All operators have read, understood and observe this User Manual, and particularly the safety regulations.

Repairs, service work

★ Refer to "Safety Concept" booklet.

★ Only original Leica Microsystems spare parts may be used.

★ Before opening the instruments, switch off the power and unplug the power cable.

★ Touching the live circuit can cause injury.

Transport

★ Use the original packaging for shipping or transporting the individual modules and the accessory components.

★ In order to prevent damage from vibrations, all moving parts that (according to the user manual) can be assembled and disassembled by the customer should be disassembled and packed separately.

Integration in third-party products

★ Refer to "Safety Concept" booklet.

Disposal

★ Refer to "Safety Concept" booklet.

Legal requirements

★ Refer to "Safety Concept" booklet.

EC Declaration of Conformity

★ Refer to "Safety Concept" booklet.

Health risks

Workplaces equipped with macroscopes facilitate and improve the viewing task, but they also impose high demands on the eyes and holding muscles of the user. Depending on the duration of uninterrupted work, asthenopia and musculoskeletal problems may occur. For this reason, appropriate measures for reduction of the workload must be taken: Optimal arrangement of workplace, work assignments and work flow (changing tasks frequently).

★ Thorough training of the personnel, giving consideration to ergonomic and organizational aspects.

The ergonomic design and construction of the Leica Z series are intended to reduce the exertion of the user to a minimum.

Direct contact with eyepieces can be a potential transmission path for bacterial and viral

Safety Instructions (cont'd.)

infections of the eye. The risk can be kept to a minimum by using personal eyepieces for each individual or detachable eyecups.

Light sources: Safety Instructions

Protective measures of the manufacturer:

- ★ UV protection screen in front of the specimen plane prevents the user from looking directly into the UV rays.
- ★ Dummy filter carriers in the free positions of the rapid filter changer prevent direct UV radiation from reaching the eyes.
- ★ UV filters are installed in the observation beam paths to protect the eyes.
- ★ The stray-light protection on the lamp housing prevents irradiation of the hands.

Warning

UV radiation could damage the eyes. Therefore:

- ★ Never look into the light spot on the specimen plane without a UV protection screen.
- ★ Never look into the eyepieces if no excitation filter is in the beam path.
- ★ Fill empty filter positions with dummy filter carriers.
- ★ Do not select a white, strongly reflective background for the specimen.

Supply unit

Always unplug the supply unit from the power supply:

- ★ When installing and disassembling the lamp housing
- ★ Before opening the lamp housing
- ★ When replacing the high-pressure mercury lamp and other parts, such as the heat-absorbing filter or the collector
- ★ During maintenance work on the supply unit

Safety Instructions (cont'd.)

Lamp housing

- ★ Never open the lamp housing while the lamp is switched on. Risk of explosion, UV exposure, blinding!
- ★ Before opening the lamp housing, allow it to cool off for at least 15 minutes. Danger of explosion!
- ★ Never cover the air duct on the lamp housing. Danger of fire!

Mercury lamp

- ★ Follow the user manual and safety instructions provided by the lamp manufacturer, and, in particular, the section on how to proceed if a lamp breaks and releases mercury.
- ★ For transport, remove the mercury lamp, transport it in its original packaging and protect moving parts in the lamp housing using the transport anchors.
- ★ When it has reached the end of its rated life (follow the manufacturer's specifications and the minute meter on the supply unit).
- ★ To minimize the risk of explosion, replace a discolored mercury lamp promptly
- ★ Leica Microsystems assumes no liability for damage caused by exploding, incorrectly installed or improperly used mercury lamps.

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The Leica Z Series

Congratulations!

Congratulations on obtaining your new Leica Z series macroscope. We are convinced it will exceed your expectations, as the Z series embodies all the qualities you associate with the name Leica Microsystems: excellent objectives, high-quality engineering, and reliability. Furthermore, the modular design ensures that the Z series adapts perfectly to your needs— no matter which accessories you require for your tasks.

Thanks to the parallax error free observation, measurements are more accurate and adaptation tasks are easier. Together with a Leica digital camera, you obtain the maximum amount of high-quality data, which also makes later evaluations on the computer much easier.

Though the reliability and robustness of Leica macroscopes is legendary, like any high-tech product, the Leica Z series requires a certain degree of care and attention. Therefore, we recommend that you read this manual. It contains all the information you need regarding operation, safety and maintenance. Simply observing a few guidelines will ensure that even after years of intensive use, your Leica macroscope will continue to work as smoothly and reliably as on the very first day.

We wish you the best of success in your work— after all, you are now equipped with the best tool!

The Modular Design: Everything is Relative

The Leica Z series provides maximum flexibility in choosing equipment, thanks primarily to the modular configuration and the compatibility that Leica has painstakingly maintained for decades. The optics carriers, eyepieces, bases and more can be combined in any way you choose, allowing you to create the macroscope that best suits your needs.

Despite this, you will notice that the controls and individual components do not differ significantly. Whichever configuration you choose, you will quickly feel right at home with your new macroscope.

Have a special request? Let us know!

Leica Microsystems enjoys an exceptional reputation when it comes to devising customer-specific solutions. If you have a special request that cannot be met with standard parts, contact your Leica consultant. He or she has a solution for every problem.

The Automatic Control System

Reliability for your experiments

For the Leica Z6 APO A and Z16 APO A automated macroscopes, motorized control of the zoom, iris diaphragm and fine focus is possible. This guarantees not only convenient work, but also added reliability for your experiments, as results can be reproduced exactly. In conjunction with the Leica LED3000 NVI™ system illuminators, a wide variety of scenarios can be set up, saved and restored at the touch of a button.

The Leica SmartTouch controls all motorized functions of the Z series and the connected accessories.

Control à la carte

You alone determine the degree of automation. The zoom, focus and illumination can be optionally controlled using the "Leica Application Suite" (LAS) software solution or via the Leica SmartTouch touchscreen panel.

To automate your workflows even more, also integrate the Leica IsoPro™ motorized XY stage – it positions multiple specimens fully automatically* or turns a series of individual images into one large, seamless illustration**, to give only two examples.

The Leica Application Suite (LAS) controls and photographs fully automatically as desired.

Talk to your Leica partner about the wide range of automation possibilities – he or she will show you how to get the maximum out of your Leica macroscope.

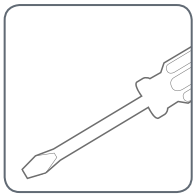
* *With LAS auxiliary module LAS MultiStep*

** *With LAS auxiliary module LAS PowerMosaic*

On We Go

If your new Leica macroscope has already been assembled and commissioned by your Leica consultant, click here to skip through the installation instructions and go directly to the Quick Start Guide on page 47.

If, on the other hand, you are assembling the Leica macroscope yourself, continue with the "Assembly" chapter, which begins on Page 17.



Assembly

Incident-light Bases and Manual Focusing Column

The first step is to connect the focusing column to the corresponding base.

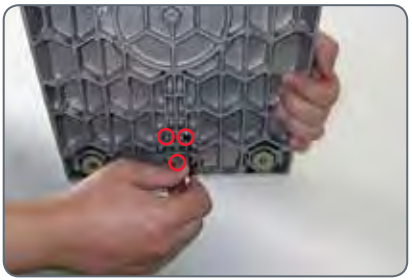
Tools used

★ Allen key provided

Assembling the focusing column

1. Lay the focusing column on the edge of a table or another stable substrate so that the three threads at the end of the column protrude over the edge.

2. Hold the incident-light to the focusing column and secure it to the base using the three screws provided.



Tip: The base can be installed more easily if someone helps you do so.

Transmitted-light Bases and Manual Focusing Column

For additional information on the TL bases, refer to page 33.

The first step is to connect the focusing column to the corresponding base.

Tools used

★ Allen key provided

Assembling the column adapter

1. Securely install the column adapter on the column using the four included screws.

Assembling the focusing drive

2. Securely screw the focusing column to the base using the six included screws.

Microscope Carrier

Tools used

★ Allen key provided

Assembling the Microscope Carrier

1. Press the microscope carrier against the focusing column.

2. Tighten the screw using the Allen key provided.

Video/Phototube A

The video/phototube A is used if only a Leica digital camera with the Leica LAS (Leica Application Suite) software is used to observe the specimen.

Assembling the tube

1. Unscrew the locking screw on the optics carrier.

2. Insert the tube into the microscope carrier.

3. Tighten the locking screw on the microscope carrier.

Installing the objective/camera

1. Screw the desired digital camera to the video objective.

2. Insert the video objective into the video/phototube A and turn the knurled ring until tight.

Video/Phototube AS ("Slim")

The video/phototube AS is intended for OEM applications and is usually not used on Leica focusing columns.

After installation on the OEM equipment, the rest of the components are installed as described on the following pages.

Video/Phototube Y

You can use the Y-tube to attach binocular tubes, ErgoModules®, video/phototubes and the Leica IC A video module of the Leica M series.

Assembling the tube

1. Unscrew the locking screw on the optics carrier.

2. Insert the tube into the microscope carrier so that the locking screw faces the rear.
3. Tighten the locking screw on the microscope carrier.

Assembling the tube

1. Insert the desired tube and turn the knurled ring until tight (refer also to page 28).

Coaxial Illuminator (Optional)

Tools used

★ Allen key provided

The coaxial illuminator is fitted between the optics carrier and the tube. It enables you to connect the light guide, which, in turn, is connected to a cold light source of the Leica CLS series.

At low magnifications, using the coaxial illuminator causes vignetting (shading), which is more or less pronounced depending on the configuration. This vignetting is not a malfunction.

The quarter-wave plate for coaxial illumination must be installed on the planapochromatic objectives.

Installing the coaxial illuminator

1. Guide the coaxial illuminator to the tube from the left or right.

2. Adjust the coax illuminator so that the port for the light guide faces the direction that is the most comfortable for your work.
3. Push the coaxial illuminator upwards and tighten the screw on the coaxial illuminator.

4. Connect the light guide of the Leica cold light source to the coaxial illuminator.

The User Manual for the Leica cold light source is provided with the cold light source.

Optics Carrier

Tools used

★ Allen key provided

The instructions on this page also apply logically if the optional coaxial illuminator has been installed (see page 24). In this case, the optics carrier is attached to the coaxial illuminator instead of the tube.Assembling the optics carrier

1. Unscrew the fastening screw on the optics carrier.

2. Guide the optics carrier to the tube from the rear.

3. Push the optics carrier upwards and tighten the fastening screw.

Fine Focus (Optional)

Tools used

★ Allen key provided

The optional fine focus allows sensitive and precise focusing in a range of 10 mm. The fine focusing is required for precise focusing at high magnifications.

Before the fine focus is installed, the diaphragm ring must be removed from the optics carrier.

Removing the diaphragm ring

1. Unscrew the 3 fastening screws on the diaphragm ring of the optics carrier.

2. Remove the diaphragm ring.

Installing the fine focus

1. Place the fine focus on the optics carrier.

2. Tighten the three fastening screws.

Objective

Tools used

★ None

You can attach the quarter-wave plate for coaxial illumination, the analyzer for polarization or a ring illuminator to the planapochromatic objectives.

HR and DM objectives are high-performance objectives and always cause vignetting. This vignetting is not a malfunction.

Attaching the objective

1. Screw the planapochromatic objective to the diaphragm ring or the optional fine focus in a counterclockwise direction.

Alternative fastening options

★ If using the objective slide, read the instructions on page 30.

Ergo binocular tube

Tools used

★ No tools required.

Prerequisite for the installation

When using the ergo binocular tube or another tube, the Y video/phototube must be used.

Preparations

1. Unscrew the positioning screw and remove the protective cover.Assembling the tube

1. Push the tube into the dovetail ring and rotate it slightly in both directions until the positioning screw meshes with the guide groove.

2. While holding the tube only slightly, carefully tighten the positioning screw. It is automatically brought to the correct position.

Eyepieces

Tools used

★ None

Magnification range

You can extend the overall magnification range using available 10×, 16×, 25× and 40× wide-field eyepieces for persons wearing glasses.

Preparation

1. If you want to use an optional graticule, insert it now (Page 54).

2. Remove the plastic tube guard.

Inserting the eyepieces

3. Push the eyepieces into the tubes as far as they will go and check to ensure that they fit tightly and accurately.

4. Securely tighten the clamping screws.

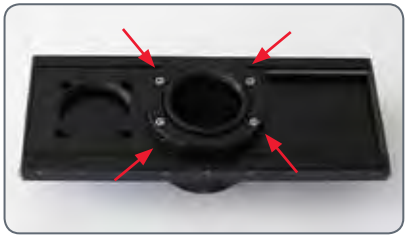
Objective Slide: Assembly

Supported objectives

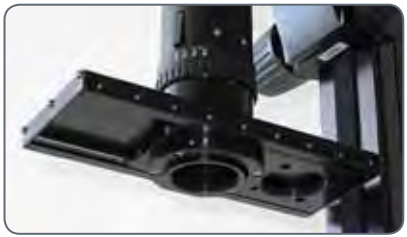
2.0× planapochromatic objective

5.0× planapochromatic objective

You can identify the centerable objective thread by the movable ring and the 4 centering screws on the front side of the ring.



Orient the objective slide during installation, preferably at an angle of 90°, so that the illuminator and the specimen are optimally accessible. The centerable objective thread is oriented towards the user.



Installing the objective slide:

1. Unscrew the 3 fastening screws on the diaphragm ring of the optics carrier.

2. Remove the diaphragm ring.

(Continued on next page)

Objective Slide: Assembly (cont'd.)

3. Place the objective slide on the optics carrier and tighten the three fastening screws.

Installing the objectives:

The 2× objective must be installed on the centerable objective thread.

The 5× objective is installed by the user at a greater distance, since this arrangement offers greater freedom of movement.

1. Screw the objectives onto the objective slide.

Objective Slide: Parcentric Adjustment of the Objectives

The optics are preset at the factory so that they are approximately parcentric. However, these settings vary depending on the configuration used. If you need a more accurate parcentric adjustment, it can be carried out subsequently manually.

The parfocality cannot be adjusted. Therefore, we recommend always focusing using the 5× objective and then switching to 2×.

Optimizing the parcentricity

1. Push the 5× planapochromat into the beam path.
2. Position an easily visible part of a specimen in the center.
3. Push the 2× planapochromat into the beam path.
4. Unscrew all 4 centering screws.

5. Look through the eyepieces and tighten the first centering screw until the objective is moved in the right direction and the readily visible part of the specimen moves towards the center.
6. Now tighten the opposite centering screw slightly.
7. Repeat the process with the other screws until you obtain parcentricity.

No preloaded screws are used. Therefore, it is mandatory to unscrew the opposite centering screw before tightening the counter-screw. Otherwise, the objective could be damaged.

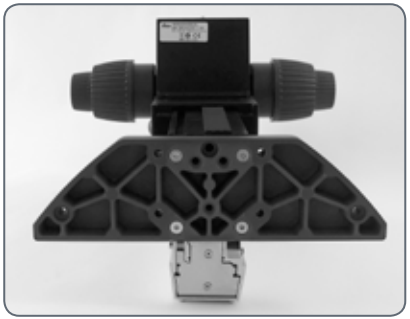
Transmitted-light Base TL ST

Unpacking the base

The base is delivered with the adapter plate installed. Make sure the instruments are unpacked on a flat, sufficiently dimensioned, and non-slip surface.

Focusing drive and column

1. Unscrew the extension plate from the base using the Allen key provided.



2. Attach your focusing drive column from below using the four hexagon-head screws.

3. Re-attach the adapter plate to its original position using the six hexagon-head screws.

Transmitted-light Base TL BFDF: Before First Use

Removing the transport anchors

Before you can use the transmitted-light base for the first time, it is absolutely necessary to remove the two transport anchors.

Transmitted-light Base TL BFDF

Standard delivery

The base is delivered with the adapter plate installed. The selected stage (Leica IsoPro™ mechanical stage or Leica standard stage 10 447 269), and the focusing drive will have to be mounted later.

Stage assembly

The Leica TL BFDF transmitted-light base can be equipped with three different stages.

- ★ Leica IsoPro™ manual mechanical stage
- ★ Leica IsoPro™ automatic mechanical stage
- ★ Leica standard stage 10 447 269

The selected stage is mounted on the base before commissioning. You can switch between the stages at any time with just a few hand movements.

The following paragraph assumes use of the base without the stage mounted. Disassembly is performed in reverse order of the following steps.

Standard stage

1. Take the glass plate from the rectangular gap in the standard stage.
2. Position the stage on the transmitted-light base in such way that the four holes align over those in the base.
3. Attach the stage to the base with the four supplied hexagon-head screws.
4. Insert the glass plate back into the standard stage.

The base is delivered with the adapter plate installed. The selected stage (Leica IsoPro™ mechanical stage or Leica standard stage 10 447 269), and the focusing drive will have to be mounted later.

Ensure that the instruments are unpacked on a level, adequately sized, and nonskid underlay.

Stage assembly

The Leica TL RC™/ RCI™ transmitted-light base can be equipped with three different Leica stages. The selected stage is mounted on the base before commissioning. You can switch between the stages at any time with just a few hand movements.

The following paragraph assumes use of the base without the stage mounted. Disassembly is performed in reverse order of the following steps.

Standard stage

1. Take the glass plate from the rectangular gap in the standard stage.

2. Position the stage on the transmitted-light base in such way that the four holes align over those in the base.

3. Attach the stage to the base with the four supplied hexagon-head screws.

4. Insert the glass plate back into the standard stage.

IsoPro™ Manual Mechanical Stage: Assembly

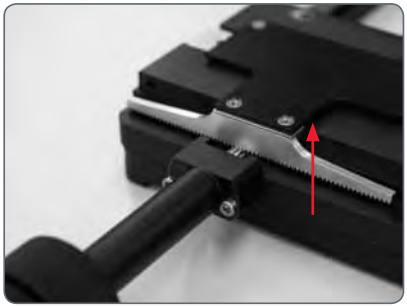
Leica IsoPro™ Mechanical Stage

Before the Leica IsoPro™ mechanical stage is mounted to the base, the axis containing the control buttons is attached either on the left or the right side of the mechanical stage.

If the controls are to be mounted on the left-hand side, the gear rod on the bottom side of the mechanical stage must be unscrewed and reattached in reverse.

1. Take the glass plate from the mechanical stage.
2. Turn the mechanical stage around and place it onto a non-slip surface.
3. Change the gear rod from the left to the right-hand side.
4. Skip the next two steps to install the controls.

Before the Leica IsoPro™ mechanical stage is mounted to the base, the axis containing the control buttons is attached either on the left or the right side of the mechanical stage.



Left or right operation

If the controls are to be mounted on the left-hand side, the gear rod on the bottom side of the mechanical stage must be unscrewed and reattached in reverse.

Leica IsoPro™ Manual Mechanical Stage: Assembly (cont'd.)

1. Take the glass plate from the mechanical stage and turn it around.

2. Change the gear rod from the left to the right-hand side.

Control assembly

1. Take the glass plate from the mechanical stage and turn it around.

2. Attach the axis with the control buttons to the desired side. The fastener snaps into the mechanical stage magnetically.

3. Attach the axis with the two supplied hexagon-head screws.

4. Attach the cover rail to the mechanical stage.

Mechanical stage assembly

1. Place the mechanical stage onto the base.

2. Pull the upper part of the mechanical stage carefully towards the user, fixing the lower part onto the transmitted-light base.

3. Attach the mechanical stage evenly to the three threaded holes.

4. Now move the mechanical stage as far as it will go in the direction of the column.

5. Insert the glass plate into the mechanical stage.

Leica IsoPro™ Manual Mechanical Stage: Assembly (cont'd.)

Focusing drive and column

1. Unscrew the extension plate from the base using the Allen key provided.

2. Attach your focusing drive column from below using the three hexagon-head screws.

3. Re-attach the adapter plate to its original position using the three hexagon-head screws.

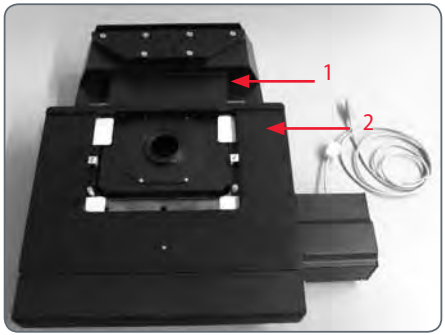
Leica IsoPro™ Motorized Mechanical Stage: Assembly

Basics

The transmitted-light bases of the Leica TL series (TL BFDF, TL RC™, TL RCI™) are supplied with an installed extension plate. The selected stage (Leica IsoPro™ mechanical stage or standard stage 10 447 269) and the focusing drive will have to be mounted later.

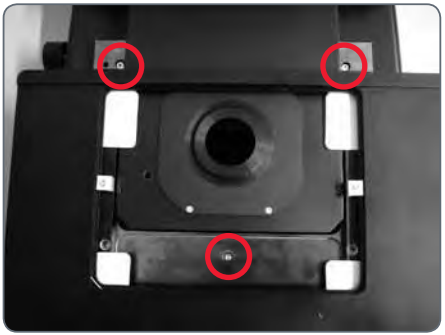
The motorized mechanical stage is a sensitive precision instrument. During installation, avoid subjecting the stage to impact or severe vibrations.

1. Unpack the mechanical stage from the transport packaging and position it on the transmitted-light base.



1 Microscope base
2 Motorized mechanical stage

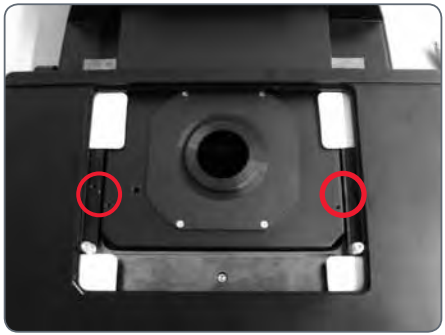
2. Secure the motorized mechanical stage to the base using three M4 screws.



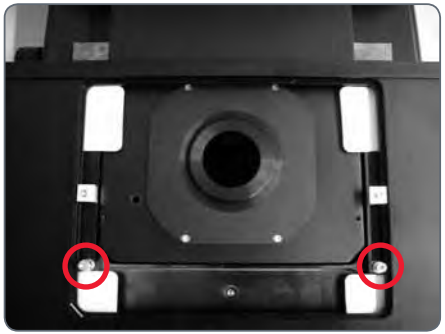
3× M4 screws

Leica IsoPro™ Motorized Mechanical Stage: Assembly (cont'd.)

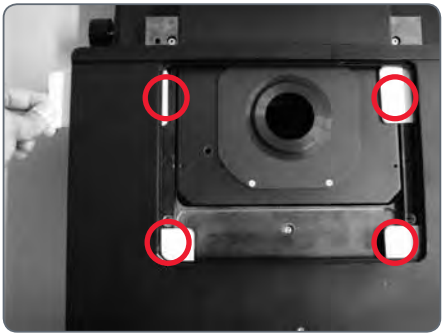
3. Remove the two M3 screws and the holder from the mechanical stage.



4. Remove the two M4 screws and the sleeve from the mechanical stage.



5. Remove the four shock-absorbing cartons from the mechanical stage.



After removal, keep all the transport anchors in the plastic bag provided for future transport.

Leica IsoPro™ Motorized Mechanical Stage: Assembly (cont'd.)

The bases

The TL BFDF, TL RC™ and RCI™ transmitted-light bases can be equipped with three different stages: Standard stage, manual and automated IsoPro™ mechanical stage. The selected stage is mounted on the base before commissioning. You can switch between the stages at any time with just a few hand movements.

The following paragraph assumes use of the base without the stage mounted. Disassembly is performed in reverse order of the following steps.

Mechanical stage and base

⚠ Never move the sledge of the motorized mechanical stage manually in the X direction, as otherwise the mechanical system will be damaged!

1. Place the mechanical stage onto the base.
2. Pull the upper part of the mechanical stage carefully towards the user and fasten the lower part onto the transmitted-light base.
3. Attach the mechanical stage evenly to the three threaded holes.
4. Now move the mechanical stage as far as it will go in the direction of the column.
5. Insert the glass plate into the mechanical stage.

Leica IsoPro™ Motorized Mechanical Stage: Assembly (cont'd.)

Mechanical stage for X-Y stage control module

1. Plug the CTL2 plug of the mechanical stage motor into one of the three available CTL2 interfaces.

2. Plug the CTL2 plug of the Leica PSC controller into another CTL2 interface.

★ The third CTL2 interface is available for connecting other instruments, such as the Leica foot switch (10 447 398) or TL RCI™ transmitted-light base (10 446 352).

★ The 15-pin Sub-D interface is intended for use with the Leica SmartMove™ controller (11 501 197).

3. Plug a power cable into the socket provided and into a grounded power socket.

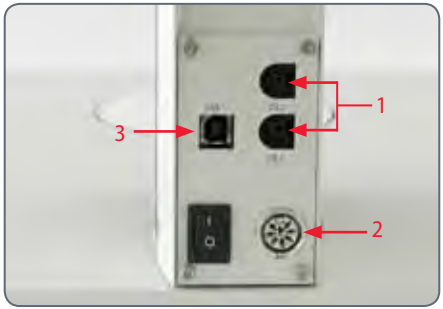
As soon as all instruments have been plugged into the control box and it has been plugged into the power supply, the mechanical stage initializes and automatically drives to the mid position.

4. Connect the PC (where applicable) and X/Y Stage DCI Module (using a suitable USB cable).

Cables: Connections

The A version of the Leica Z series features extensive automation options with which various microscope data and settings can be read out, transferred to the PC and reproduced later.

The terminals



The connection to the PC and to other instruments is made using the terminals on the rear side of the column:

1. 2× CTL2 terminals for auxiliary equipment such as the distribution box of the Z series, the SmartTouch panel, the Leica TL RCI base and other accessories from the Leica product range.

2. Terminal for the power supply provided.

3. USB terminal for the connection to the PC.

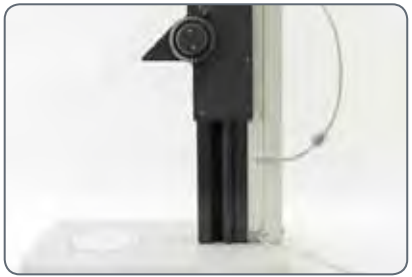
Cables: Cable Duct

The integrated cable duct in the column enables a neat cable layout around the macroscope. For example, the USB or FireWire cables of the camera can be stowed in the cable duct.

Feeding the cables

1. Unscrew the three screws on the cable duct.

2. Remove the cover of the cable duct.
3. Place the cables in the cable duct and screw the cover on tightly.



Tip: Estimate the length of the cable ends you will need before screwing on the cover. For thick cables, it is difficult to change the length retroactively.

Leica LED3000 NVI™ (Near Vertical Illumination)

Required tools

★ None

The Leica LED 3000 NVI™ can be used with any objectives that have an outer diameter of 58 mm.

The supported working distance is between 50 mm and 150 mm.

Installing the Leica LED3000 NVI™

1. Connect the Leica LED3000 NVI™ to the focusing column via the CTL2 connection if the focusing column is equipped with integrated electronics.

Alternative installation for manual columns

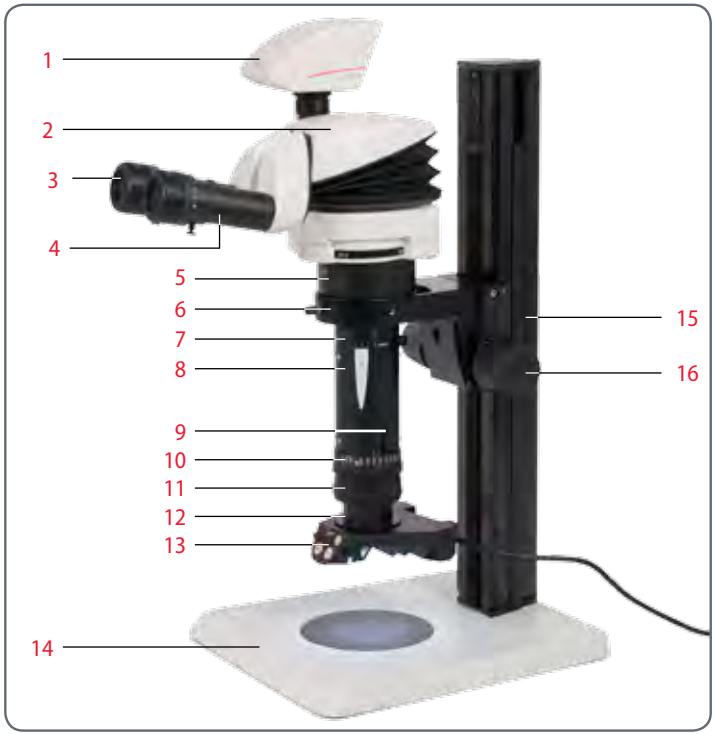
1. Connect the external power supply unit (10 450 266) to the Leica LED3000 NVI™.

2. Place the Leica LED3000 NVI™ on the objective from below and tighten the locking screw.

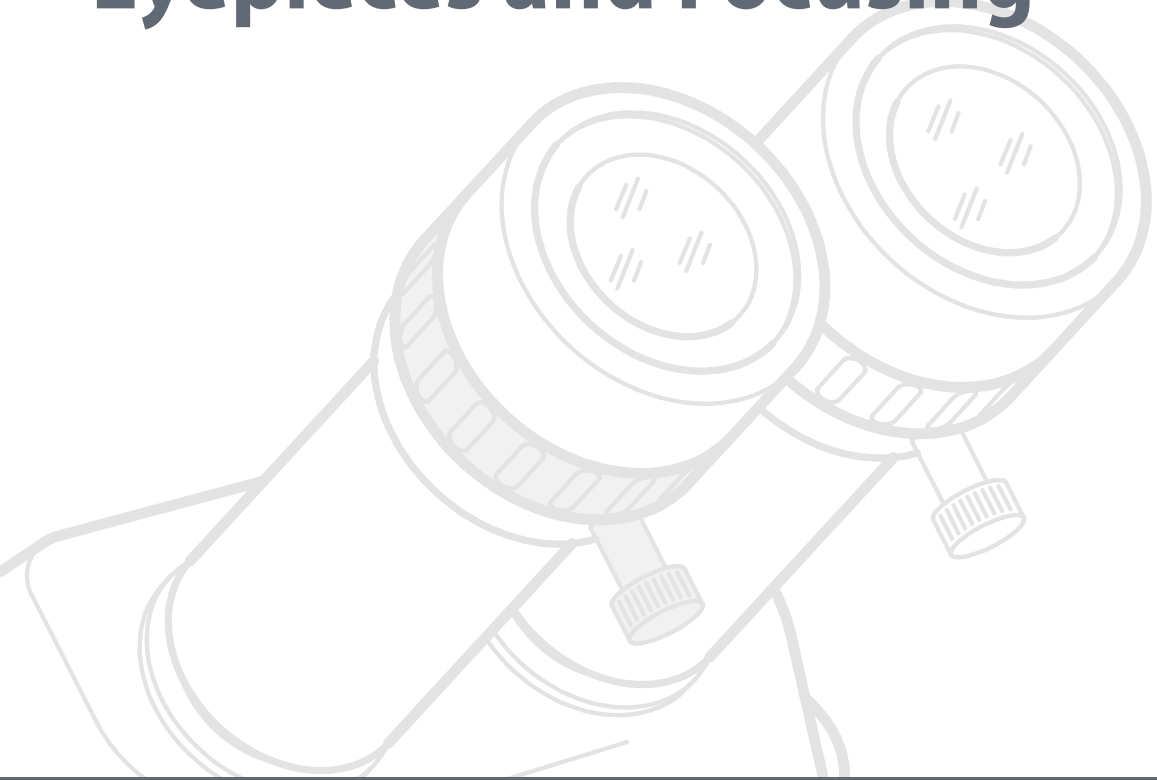
Quick Start Guide

Overview of a Manual Leica Z Series Macroscope (Leica Z16 APO)

1 *Digital camera*
2 *ErgoTube™*
3 *Eyepieces*
4 *Adjustable eyepiece tubes*
5 *Video/Phototube Y*
6 *Microscope carrier*
7 *Iris diaphragm*
8 *Optics carrier (zoom body)*
9 *Click stops on/off*
10 *Zoom wheel*
11 *Fine focus*
12 *Objective*
13 *LED ring illuminator*
14 *incident-light*
15 *Microscope column*
16 *Focusing drive*



Eyepieces and Focusing



Magnification Factors of the Eyepieces

An eyepiece not only makes it possible to look passively into the macroscope, but also has a critical effect on the maximum magnification. The magnification factor is between 10x and 40x.

The following eyepieces are available for the Z series:

Magnification	Dioptric Correction	Order number
10×	± 5 diopter settings	10 450 023
16×	± 5 diopter settings	10 450 024
25×	± 5 diopter settings	10 450 025
40×	± 5 diopter settings	10 450 026

Using the Eyepieces

The eyepieces form the connection between the tube and the eye of the observer. Simply push them into the tube and they are ready to use.

Each eyepiece offers a certain magnification factor that has a determinative effect on the total magnification. Furthermore, all Leica eyepieces can be equipped with practical graticules that enable measuring and quantifying of specimens.

Dioptric Correction

A built-in dioptric correction is available for eyeglass wearers. For more information, refer to page 53.

If you do not wear glasses:

1. Hold the eyepiece firmly and rotate the eyecups forwards counterclockwise.

2. If an eyepiece is equipped with the integrated dioptric correction, turn the value to the "0" mark.

If you wear glasses:

1. Hold the eyepiece firmly and rotate the eyecups clockwise towards the rear, as otherwise the viewing distance is too great.

2. If an eyepiece is equipped with the integrated dioptric correction, turn the value to the "0" mark.

By the way, one benefit of viewing with eyeglasses is a drastically lower risk of bacterial transmission (see page 55). The soft material of the eyecup also ensures that your glasses will not be scratched, even if they contact the eyepiece.

The Correct Interpupillary Distance

The interpupillary distance is correctly set if you see a single circular image field when looking at a specimen.

If you are still a novice macroscope user, you may need a short time to become accustomed to this. Not to worry—after a little while, it will become automatic.

Reference value

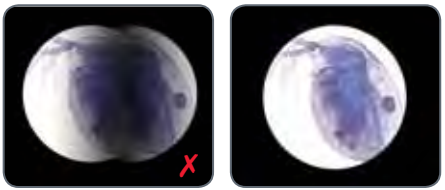
The distance between eye and eyepiece measures approx. 22 mm for 10/23B wide-field eyepieces for persons wearing glasses.

Adjusting the interpupillary distance

1. Look into the eyepieces.

2. Hold the eyepieces with both hands. Push the eyepieces together or separate them until you see a circular image.

3. Slowly approach the eyepieces with your eyes until you can see the complete image field without corner cutting.



Dioptric Correction

Leica macroscopes are parfocally matched. A prerequisite for this the correct setting of the diopters. The following adjustments only have to be carried out once by each user.

Therefore, all Leica eyepieces are also available with built-in dioptric correction, allowing the macroscope to be used without glasses even by those with vision problems. The correction comprises ±5 diopter settings.

Using the Dioptric Correction

1. Set the dioptric correction of both eyepieces to the mid position ("0" diopter settings).
2. Look through the eyepieces and focus on a flat specimen.
3. Rotate both eyepieces to the maximum value of "+5".
4. Hold one eye closed and rotate the other eyepiece in the "-" direction until the specimen appears sharp.
5. Then, open the other eye and correct the diopter settings until the image is uniformly sharp.
6. Select the highest magnification and refocus if necessary.

Now, if you adjust the magnification from the lowest to the highest level, the specimen is always brought into sharp focus. If not, repeat the process.

The system is now parfocally matched to your eyes.

Reticules

Use

Leica reticules make length measurements and counting easier, particularly for workstations that are not equipped with a digital camera and LAS software.

The Leica reticules for length measurements and numbering are fitted in mounts and are inserted into the eyepieces.

1. Screw the insert off of the eyepiece.

2. Clamp the reticule on the insert, applying moderate pressure. Ensure that the graticule fits tightly.

3. Screw the insert and reticule firmly into place and replace the eyepiece in the tube.

4. You can now align the reticule by rotating the eyepiece in the tube and then tightening it using the clamping screw.

Health Notes

Potential sources of infection

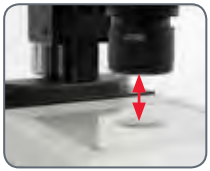
Direct contact with eyepieces is a potential transmission method for bacterial and viral infections of the eye. The risk can be kept to a minimum by using individual eyepieces or detachable eyecups. Eyecups can be ordered separately. Please contact your Leica partner.

Separate eyecups are an effective way of preventing infections.

Focusing

Focusing raises or lowers the macroscope using the focusing drive. The specimen detail is brought into sharp focus as soon as it is in the focal point of the objective.

★ The focusing drive can be operated either left- or right-handed.



Focusing

★ The inner, coarse adjustment is used for covering great distances.

★ The outer, fine adjustment is used for fine focusing.

Coarse/fine adjustment

The sharpness is adjusted using the coarse/fine adjustment.

2. The coarse/fine adjustment carries a load of up to 15 kg.

The resolution of the coarse/fine adjustment is 1 µm.

Adjusting the Resistance of the Focus Drive

Adjusting the resistance

Is the focus movement too loose or too tight? Does the outfit tend to slide downwards? The resistance can be adjusted individually depending on the equipment weight and personal preferences as follows:

1. Grip the outer drive knobs with both hands and turn them towards each other until the desired resistance is reached during focusing.

Fine Focusing

The optional fine focus allows sensitive and precise focusing in a range of 10 mm. The fine focusing is required for precise focusing at high magnifications.

Fine Focusing

1. Using the focusing drive, focus on the specimen as accurately as possible (see p. 56).

2. Rotate the fine focus to optimize the focus.

Changing Magnification (Zoom)

The Z series macroscopes have an integrated zoom. The name indicates the zoom range covered:

★ Leica Z6 APO (A) = 6.3:1

★ Leica Z16 APO (A) = 16:1

The rotary knob for the zoom can be used either left or right-handed.

Zooming

1. Look into the eyepieces.
2. Focus on the specimen.
3. Rotate the zoom wheel until the desired magnification is configured.

Enabling and disabling ratchet steps

The zoom button can optionally be operated either with or without ratchet steps. Continuous zoom is possible when the ratchet steps are disabled, which many users find convenient. On the other hand, when the ratchet steps are enabled, photographs, measurement results etc. can be reproduced more accurately.

Enabling and disabling ratchet steps

1. Push the button downwards to disable the ratchet steps.

2. Push the button upwards to enable the ratchet steps.

Iris Diaphragm

The iris diaphragm in the optics carrier of your Z series macroscope fulfills the same purpose as the iris diaphragm in a camera: it regulates the available light, which changes the depth of field. The "depth of field" (or "focus depth") is the area of a specimen that is brought into sharp focus.

Closing the iris diaphragm

★ Close the iris diaphragm by turning the knob to the right in the direction indicated by "1". The subject appears darker and the depth of field increases.

Opening the Iris Diaphragm

★ Open the iris diaphragm by turning the knob to the left in the direction indicated by "5". The subject now appears brighter, but the depth of field decreases.

Photography & Video

Photography & Video

For most macroscope users, digital documentation has become an invaluable part of their work. Research results can be presented in an attractive manner; measurements on the digital image provide clarity and, in conjunction with the motorized IsoPro™ mechanical stage, even images of large specimens can be captured step by step and automatically joined to create a new complete image.

Adapter

If camera control using the Leica Application Suite is not required, conventional mirror reflex and rangefinder cameras from third-party manufacturers can be used. For this purpose, Leica Microsystems offers a variety of adapters that can be used together with the 50% and 100% trinocular tubes.

Leica DFC cameras

However, if you require absolute control over the camera and need the capability for measurement, evaluation and more in addition to photography, the digital Leica DFC cameras are exactly right for you. Together with the Leica Application Suite, they provide virtually limitless freedom of use. For additional information about Leica cameras, refer to the camera's documentation.

Leica Application Suite

The "Leica Application Suite", or "LAS" for short, is, as it were, the digital extension of the Leica Z series macroscopes. In addition to capturing images, it lets you control the macroscope, illuminator, stages, cameras and more. For additional information, refer to the LAS online help.

Photo Tubes and C-mounts

Application

All Leica DFC cameras are equipped with a standardized C-mount interface. In turn, the C-mount adapter for the respective trinocular tube is connected to this interface. This adapter creates a solid mechanical connection between the macroscope and camera and ensures optimum rendering of the macroscopic image on the image sensor of the camera.

Usually, the ideal is for the digital camera to capture as much of the field of vision as possible, while excluding as much of the black edge of the field of vision as possible. To do so, the magnification factor of the C-mount adapter must match the image format of the sensor as closely as possible (see table).

If there is unwanted shading at the corners even with a compatible C-mount adapter installed, it can be corrected using the "Shading function" of the camera software.

Alternatively, you can also use a C-mount adapter with higher magnification. This primarily avoids the critical border area of the field of vision and concentrates on the center of the field of vision.

Camera	optimal (large image field)	suitable (smaller image field)
DFC295	0.5×	0.63×
DFC420	0.5×	0.63×
DFC490	0.63×	0.8×
DFC500	0.63×	0.8×

Cameras from third-party suppliers

In addition to Leica DFC cameras with the standardized C-mount interfaces, you can connect third-party cameras such as single-lens reflex cameras to the macroscope using a T2 bayonet adapter. To do so, instead of the C-mount adapter, simply use the corresponding SLR adapter with T2 connection. However, these third-party cameras are not integrated into the Leica Application Suite and have to be operated using the corresponding software from the camera manufacturer.

The Leica digital cameras are detailed in a separate user manual along with instructions for their assembly and use.

Trinocular Video/Phototube 50%

Use

With its third beam path, the trinocular video/ phototube 50% enables you to simultaneously view and photograph a specimen. The available light is divided as follows:

- ★ 50% is available for the two eyepieces.
- ★ 50% of the light is diverted to the video/ photo beam path.

Assembly

Fasten the "trinocular tube 50%" to the optics carrier instead of the ErgoTube™ (refer also to page 28).

Trinocular Video/Phototube 100%

Use

With its third beam path, the trinocular video/phototube 100% enables you to either view or photograph a specimen. This means that 100% of the light is available to one or the other beam path. The other beam path remains opaque or black.

Assembly

Fasten the "trinocular tube 100%" to the optics carrier instead of the binocular ErgoTube (refer also to page 28).

Switchover

★ Turn the controller on the right side of the tube into the horizontal position in order to guide all available light into the eyepieces. You can now observe the specimen.

★ Turn the controller on the right side of the tube into the vertical position in order to guide all available light into the camera. You can now photograph the specimen.

Objectives and Optical Accessories

The Different Types of Objectives

To meet the various requirements regarding imaging properties, there is a choice of high-quality interchangeable planachromatic and planapochromatic objectives and also lower-priced interchangeable achromatic objectives. You can use the objectives on the Z6 APO or Z16 APO zoom systems or with the fine focusing.

★ We recommend using the 1×, 2×, 5×, 0.8×, 0.5× planapochromatic objectives in order to take advantage of the high performance of the apochromatic zoom system.

★ You can attach the quarter-wave plate for coaxial illumination, the analyzer for polarization or the ring illuminator to the planapochromatic objectives.

★ Also available are the M series 0.63×, 0.5×, 0.32× achromatic objectives, which can be attached to the zoom or the fine focusing using an adapter.You can attach the vertical illuminator or the attachment for incident/oblique observation to the achromatic objective.

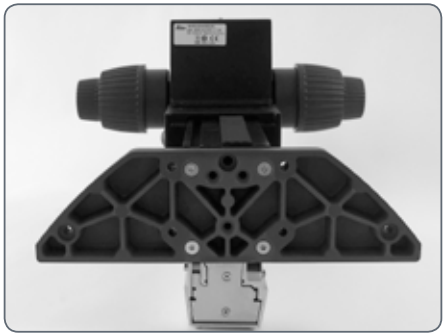
Achromatic objectives with a long focal length

For special applications, achromatic objectives with long working distances and focal lengths of f=100 mm to 400 mm are available.

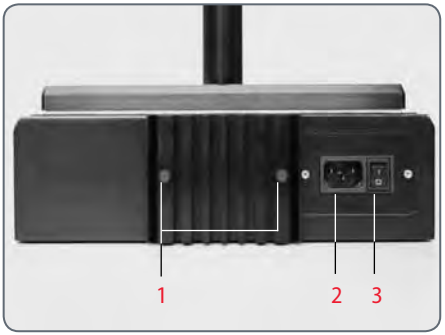
Bases

Leica TL ST Transmitted-light Base: Controls

1 *Adapter plate for easy assembly of focusing drives*
2 *Removable glass plate*
3 *Controller for light intensity*
4 *Adjustment for deflection mirror*



Extension plate of the transmitted-light base TL ST



Rear side of the transmitted-light base TL ST
1 *Screws for changing the halogen lamp*
2 *Power connection socket*
3 *Power switch*

Leica TL ST Transmitted-light Base: Operation

Light intensity control

The left control adjusts the intensity of the 12 V/20 W halogen illumination.

1. Switch on the illumination of the base at the power switch.

3. Focus on the specimen.

3. Set the illumination to the desired intensity using the left control.

Transmitted-light control

The transmitted-light base TL BFDF has a slider that automatically moves the deflection mirror in the base when moved. The mirror is kept in the correct position at all times and permits smooth changeover between bright field and opaque transmitted light.

Bright field

Bright field is suitable for examining translucent objects featuring contrasting structures. The object is directly illuminated from below and is seen in its natural colors against a bright background.

★ Move the slider backwards until the desired effect is achieved.

Inclined transmitted light

Transmitted light that traverses the object obliquely will provide additional resolution and information when observing semitransparent, opaque objects.

★ Slowly pull the slider towards yourself until the desired effect is achieved.

Leica TL ST Transmitted-light Base: Changing Bulbs

Changing the halogen lamp

Before you change the lamp, it is absolutely necessary to unplug the power plug from the base to prevent the risk of electric shock!

The halogen lamp becomes very hot during operation. Therefore, to avoid being burned, let the base cool off for approx. 10 minutes after switching it off!

Do not touch new halogen lamps with your bare fingers—this drastically reduces the service life of the lamp!

Changing Bulbs

1. Unscrew the two screws on the heat sink and pull the heat sink out, along with the lamp.

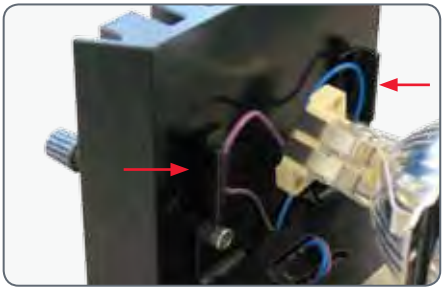
2. Carefully pull out the lamp and mount by pulling them upwards.

3. Disconnect the lamp from the mount.

4. Insert the new lamp into the mount and reinsert the lamp holder.

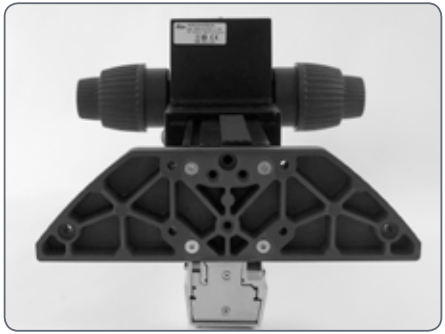
Precautionary measures

When inserting the lamp, ensure that the cables are inside the two metal clamps. This prevents the cables from getting caught during insertion.

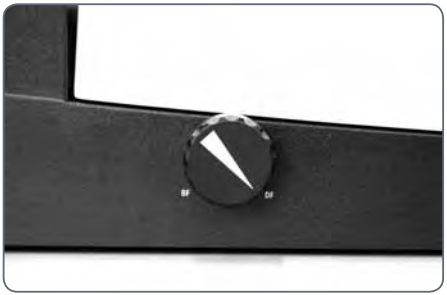


Leica TL BFDF Transmitted-light Base: Controls

1 *Adapter plate for easy assembly of focusing drives*
2 *Standard stage 10 447 269*
3 *Button to toggle between bright field and dark field*



Extension plate of the Transmitted-light Base TL BFDFb



Button to toggle between bright field and dark field

Adapter at the focusing drive

Connector for cold light sources (light conductor active f = 10mm, end tube f = 13mm)

Leica TL BFDF Transmitted-light Base: Operation

Light intensity control

Observe the user manual—in particular, all safety regulations—from the manufacturers of the light guide and cold light source.

★ Switch on the cold light source according to the manufacturer's user manual and adjust the brightness.

Transmitted-light control

The Leica TL BFDF transmitted-light base has a control that switches the light from "bright field" to "dark field".

Bright field

Bright field is suitable for examining translucent objects featuring contrasting structures. The object is directly illuminated from below and is seen in its natural colors against a bright background.

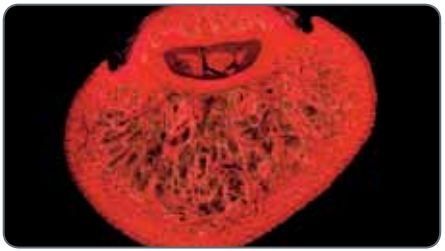
★ Turn the control as far as it will go towards "BF" ("bright field").

Dark field

In dark-field illumination, a ring illuminator is used in such a way that the direct light does not reach the objective without a specimen. Only the structure of semitransparent, opaque objects disperses the light, making the object visible against a dark background.

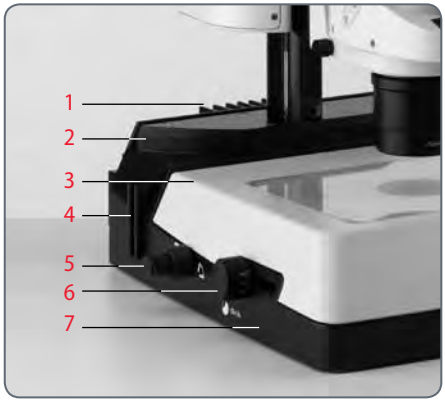
★ Turn the control as far as it will go towards "DF" ("dark field").

Fingertip with bright field illumination

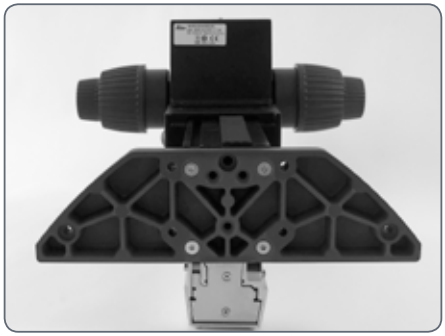


Identical subject with dark field illumination

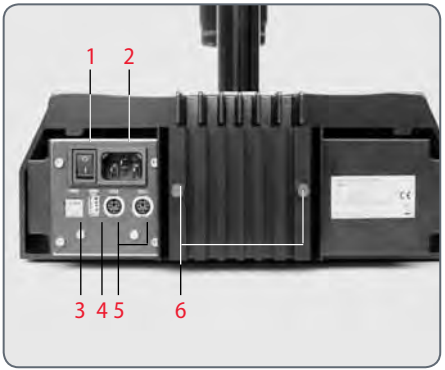
Leica TL RC™ / TL RCI™: Controls



1 *Heat sink of the integrated halogen illumination (only TL RCI™)*
2 *Extension plate for focusing drives*
3 *Standard stage 10 447 269*
4 *Filter holder*
5 *Control of top and bottom flaps of the Rottermann Contrast™*
6 *Button for mirror and horizontal movement of the mirror*
7 *Transmitted-light base*



Vertical column - transmitted-light base adapter plate



1 *Power switch*
2 *Power connection socket*
3 *USB socket, type B*
4 *USB socket, type A*
5 *2 CAN bus*
6 *Screws for changing the halogen lamp*

Leica TL RCI™: The Deflection Mirror

Tilted mirror

The built-in mirror features one flat and one concave side and can be rotated and moved. The concave side has been specially designed for the optical requirements of objectives with a high numerical aperture. The black rotary knob on the left side of the transmitted-light base can be used to rotate the built-in path-folding mirror and move it forwards/back.

The concave cutout on the handle indicates the concave side of the mirror, allowing intuitive operation at any time without eye contact.

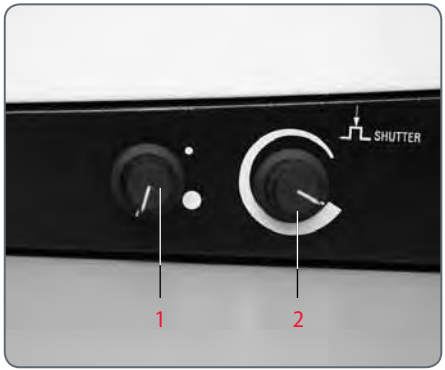
The angle of light incidence in the specimen plane changes depending on the tilt and position of the mirror. As a result, switching between transmitted-light bright field, oblique illumination and dark field-like illumination is possible.

Functions of the rotary knob

The rotary knob (1) fulfills the following tasks:

- ★ Turning the deflection mirror from the flat to the concave side
- ★ Slight tilting to guide the light beam through the specimen plane at a steeper or flatter angle
- ★ Moving the deflection mirror (forwards/back)

Leica TL RCI™: Color Intensity and Temperature



1 *Potentiometer for controlling the CCIC™ (Constant Color Intensity Control) illumination intensity*
2 *Potentiometer for controlling the color temperature*

The transmitted-light base TL RCI™ has two electronic potentiometers that control the color intensity (1) and color temperature (2).

The controller for the color temperature simultaneously serves as an electronic shutter:

★ To interrupt your work, click the potentiometer (2).

★ Click again to switch on the illumination. The electronics returns the color temperature to the previously configured settings.

Using a USB mouse (only TL RCI™)

The Leica USB mouse controls the CCIC™ and dimming function of the TL RCI™ base. Connect the mouse to the corresponding USB port of the base.

★ The scroll wheel of the mouse is occupied by default with the CCIC™ control system and is used to control the illumination intensity.

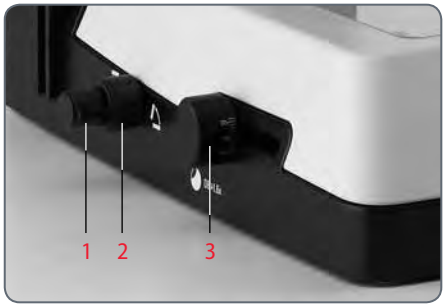
★ To switch the illumination on or off, briefly click the scroll wheel.

★ To enter or exit dimming mode, click and hold down the scroll wheel for longer than 2 seconds.

Leica TL RC™ / TL RCI™: Operation

Setting the relief contrast

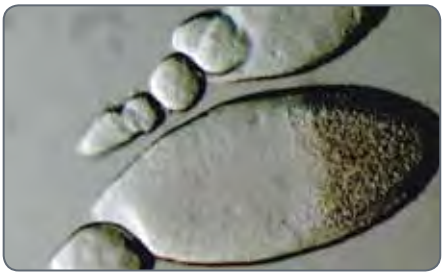
The two switches on the left side of the transmitted-light base TL RC™/TL RCI™ activate two built-in flaps. The outer switch (1) controls the inverted relief contrast, and the inner switch (2) adjusts the positive relief contrast.



1 *Switch for adjusting the inverted relief contrast*
2 *Switch for adjusting the positive relief contrast*
3 *Deflection mirror*

Depending on the flap position, a part of the opening of the built-in Fresnel lenses are covered, which results in the different contrast effects. Phase structures typically act as spatial, relief-type images—in the positive relief contrast like hills, in the inverted relief contrast like valleys.

Increased contrast without relief is attained if both diaphragms are set to 45°. A gap-like illuminated area is created. By tilting the deflection mirror slightly, you can move the gap over the entire field of view and quickly toggle between positive and negative relief images. The dynamic effect makes it easy to distinguish phase structures from amplitude structures.
(refractive index of the environment) and the perception of the viewer, it is possible that the switches described below for positive and inverted relief contrast are to be operated in reverse. This means that the lower switch, rather than the upper switch, controls the inverted relief contrast and vice-versa.



Leica TL RCI™: Methods in Transmitted Light

Vertical bright-field illumination
Suitable for stained amplitude specimens with sufficient contrast.

The light beams are deflected vertically through the specimen. This results in an accurate bright field with maximum brightness.

Inclined transmitted light
Suitable for semitransparent, opaque specimens such as foraminifera and fish eggs. Move the deflection mirror until the desired data are visible.

Single-sided dark field
Suitable for fixed specimens and fine structures.

The flatter the angle at which the light beams are deflected into the specimen plane, the darker the substrate appears. A dark field-like transmitted light is created. Outlines, fine edges and structures are bright, in contrast with the dark background, through diffraction of the light beams on the dark background.

Leica TL RCI™: Relief Images

Starting position

1. Push the deflection mirror all the way back towards the column.

2. Turn the deflection mirror into the notch position at an angle of 45°.

Positive relief contrast

Suitable for semitransparent and transparent specimens. The phase structures look like hills.

The effect can be strengthened or weakened by gently tilting the deflection mirror.

Negative relief contrast

Suitable for semitransparent and transparent specimens. These settings result in a negative relief contrast. Phase structures look like valleys.

The effect can be strengthened or weakened by gently tilting the deflection mirror.

Leica TL RCI™: Relief Images (cont'd.)

Dynamic relief contrast

Suitable for semitransparent and transparent specimens.

By tilting the deflection mirror slightly, you can move the gaps over the entire field of view and quickly toggle between positive and negative relief images. The dynamic effect makes it easy to distinguish phase structures from amplitude structures.

Constraints

The relief methods provide good results from mid-zoom to high magnifications and with 1×, 1.6× and 2× objectives. In the lower zoom half and with weaker specimens, the object field may not be uniformly illuminated.

We recommend using the transmitted-light base with 1× or higher objectives, and not objectives with a long focal length.

Using Filters

Filters for Leica TL RC™ and TL RCI™

The transmitted-light bases TL RC™ and TL RCI™ can be equipped with up to three filters—available as accessories—simultaneously. By customer request, the filters are also available as one-off items.

1. Switch off the light source or click (Leica TL RCI™) the button for the shutter.

2. Take the empty filter from an available filter slot in the filter holder.

3. Insert the desired filter.

4. Switch the light source back on.

Daylight filter for Leica TL ST

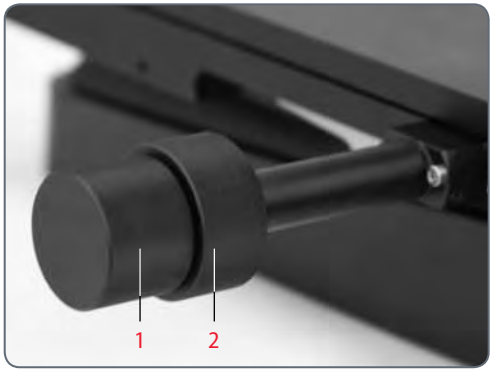
A daylight filter is also available for the Leica TL ST transmitted-light base.

Leica IsoPro™ (Non-motorized): Controls

Operating the Leica IsoPro™ mechanical stage

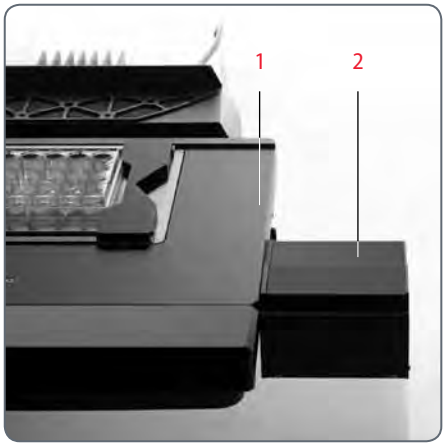
1. To move the stage in the X direction, rotate the outer knob.

2. To move the stage in the Y direction, rotate the inner control ring.



Leica IsoPro™ (Motorized): Controls

IsoPro

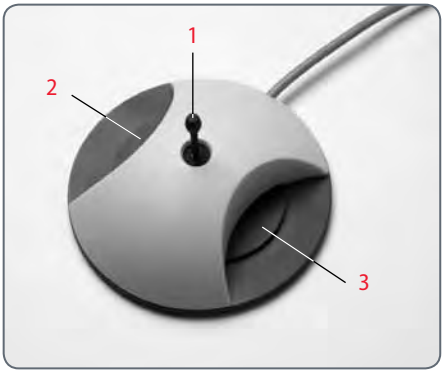


1 Leica IsoPro™ motorized mechanical stage
2 Housing with motorization

X/Y Stage DCI module

1 Sub-D interface for Leica SmartMove™
2 3 CTL2 interfaces
3 USB interface (type B)
4 Socket for grounded power cable

Leica PSC Controller



1 Quick control/memory function
2 Fine control in X direction
3 Fine control in Y direction

System Illumination

Leica LED3000 NVI™ (Near Vertical Illumination)

The intensity of the illuminator can be adjusted in 10 increments.

The Leica LED3000 NVI™ can also be controlled via the Leica Application Suite (LAS) or the Leica SmartTouch.

The supported working distance is between 50 mm and 150 mm.

Use

- The light of the Leica LED3000 NVI™ can be very bright. Therefore, always switch on the illuminator *before* you look through the eyepieces!

1. Switch on the illuminator by briefly pressing the ⏻ (ON/OFF) button.

The green LED on the upper left corner now lights up.

2. Adjust the brightness by briefly pressing the ⊕ or ⊖ buttons.

3. Switch off the illuminator by briefly pressing the ⏻ button.

Accessories

Leica PSC Controller

Use

The Leica PSC controller gives you precision control of the Leica IsoPro™ motorized mechanical stage.

Connection

Connect the Leica PSC controller and the Leica IsoPro™ motorized cross-stage to the DCI box.

Passing over the specimen quickly

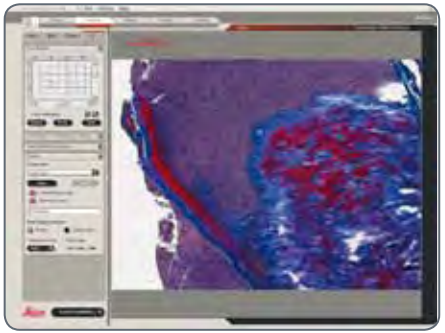
★ Move the joystick in any desired direction (including diagonally) to control the mechanical stage quickly.

Fine control of the mechanical stage

The motorized Leica IsoPro™ mechanical stage offers an accuracy of up to 0.25µm. To move to a position with maximum accuracy, use the left and right knobs on the joystick.

Control by LAS

The instructions for controlling the Leica IsoPro™ using the Leica Application Suite are provided in the software's help file.



Leica SmartTouch

The Leica SmartTouch allows you to control and save all automatic functions and reload them if required. This gives you maximum assurance for your experiments, since you can reproduce every situation quickly and easily.

For additional information about the Leica SmartTouch and operation, refer to the User Manual provided with the instrument.

Manual Control

Focusing

Turning counterclockwise = downwards
Turning clockwise = upwards

Toggle between coarse and fine focusing

1. Press the black button briefly.

When the system is switched on, the coarse focus is always switched on also.

Information about the focus positions

- ★ Focus positions can be stored using the manual control or on the computer.
- ★ A total of up to 5 focus positions can be stored.
- ★ If a sixth focus position is stored, the one nearest to it will be deleted.
- ★ Each focus position can be canceled individually.
- ★ The system will travel to each of the individual focus positions in the sequence in which they were stored.
- ★ Switching off the system cancels all of the stored focus positions.

Saving the focus positions

1. Focus on the first specimen detail.
2. Press the red switch for at least 1.5 seconds. Short beeps provide confirmation.
3. Focus on the next specimen details and save these positions also.

Moving to stored focus positions

1. Press the red switch briefly.

Deleting stored positions

Press the red switch until you hear the audible signal: 2 short beeps – pause – 2 long beeps.

Footswitch

Focusing

1 Upwards
2 Downwards

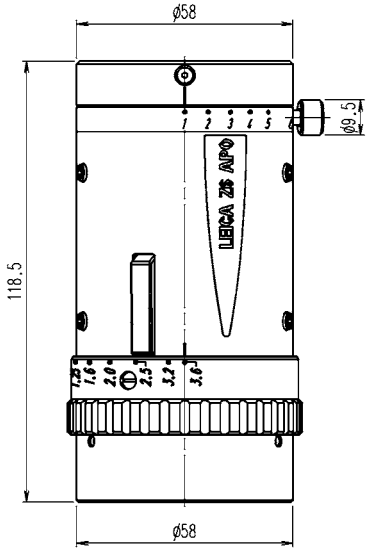
Toggling between coarse and fine focus

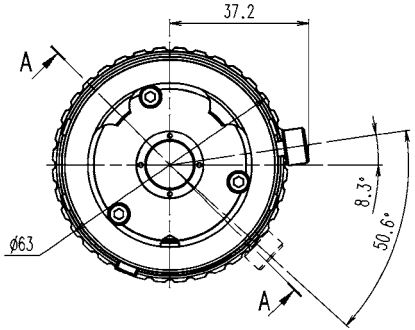
Press the left and right switches simultaneously.

Focus positions cannot be stored using the footswitch.

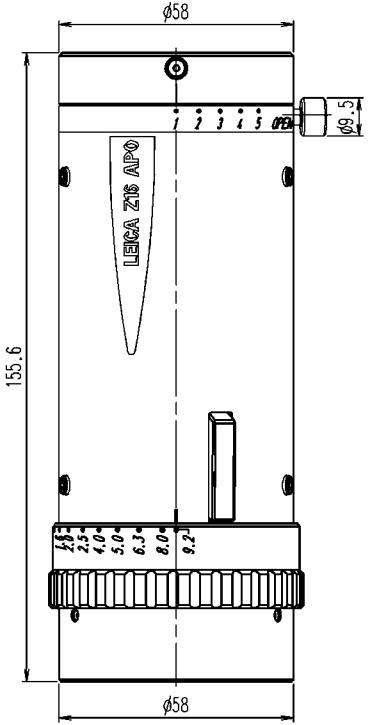
Dimensional Drawings

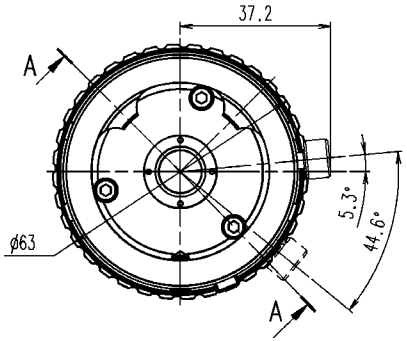
Leica Z6 APO



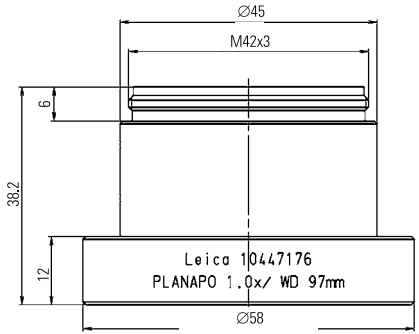


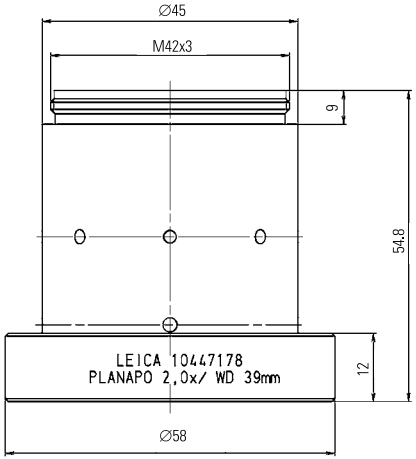
Leica Z16 APO

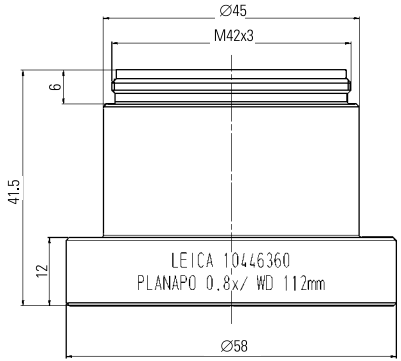


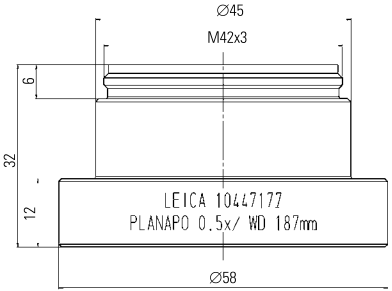


Objectives

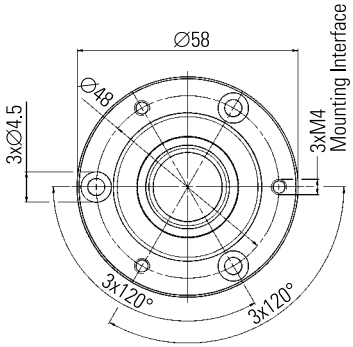

Ø45
M42x3
6
38.2
12
Leica 10447176
PLANAPO 1.0x/ WD 97mm
Ø58

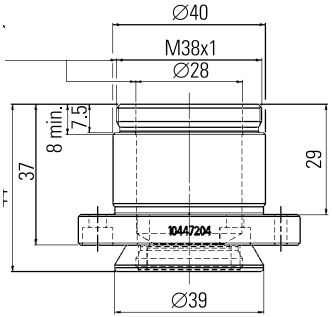

Ø45
M42x3
9
54.8
12
LEICA 10447178
PLANAPO 2.0x/ WD 39mm
Ø58


Ø45
M42x3
6
41.5
12
LEICA 10446360
PLANAPO 0.8x/ WD 112mm
Ø58


Ø45
M42x3
6
32
12
LEICA 10447177
PLANAPO 0.5x/ WD 187mm
Ø58

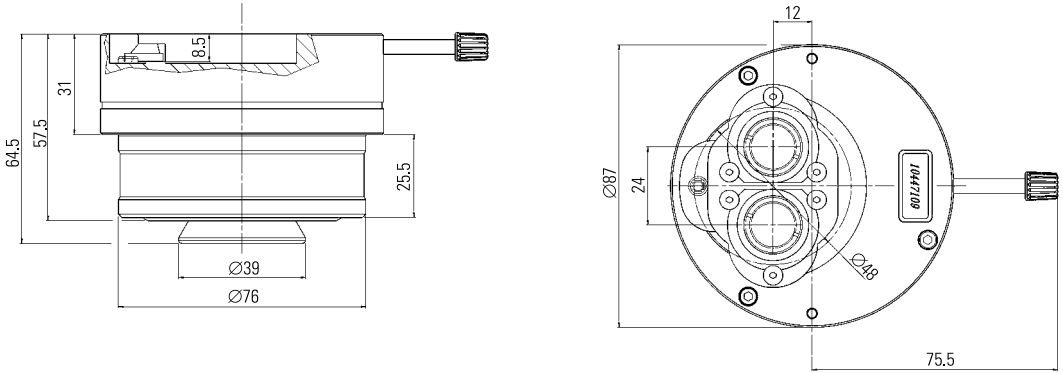
Video/phototube AS



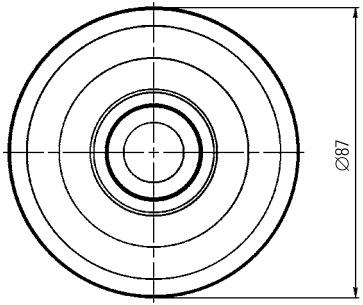


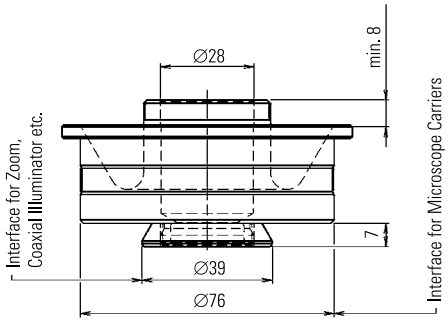
(Interface for Zoom,
Coaxial Illuminator, etc.)

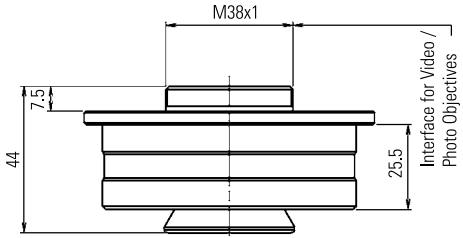
Y tube



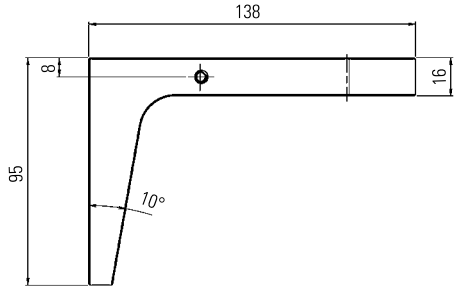
Video/Phototube A

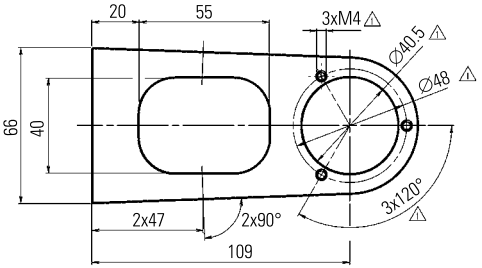


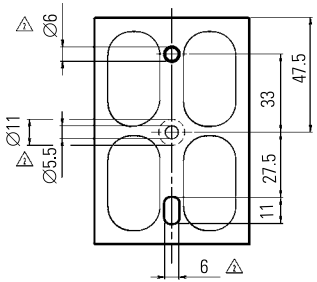




Microscope carrier

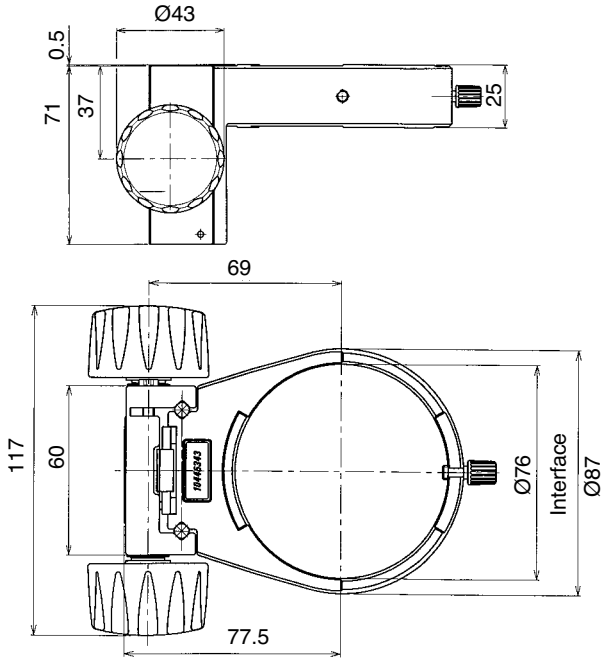


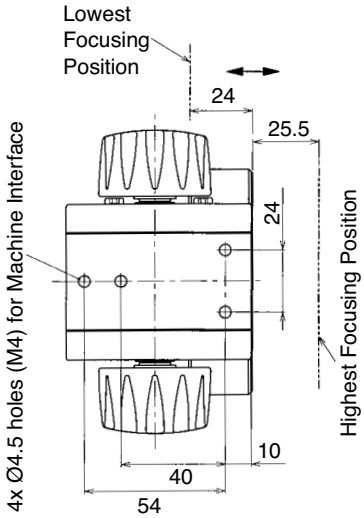




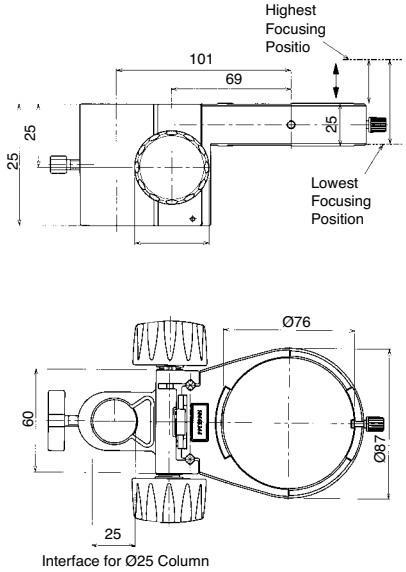
Carrier for AS tube

Focusing arm for probers

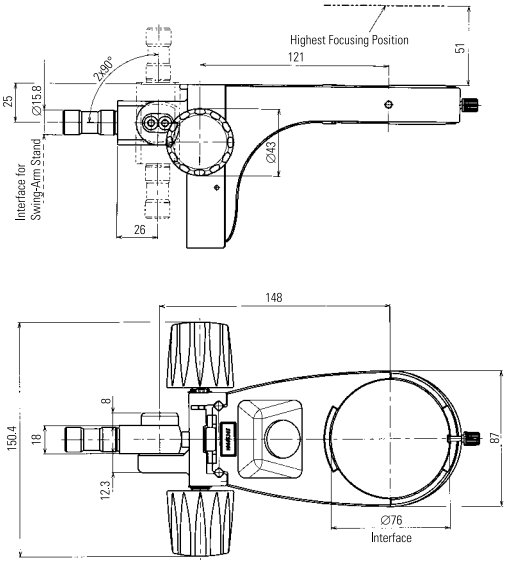




Focusing arms

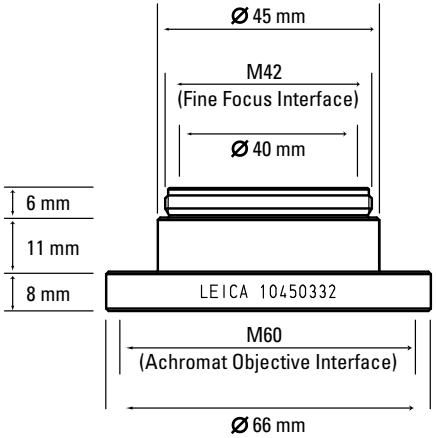


Focusing arm for bonders

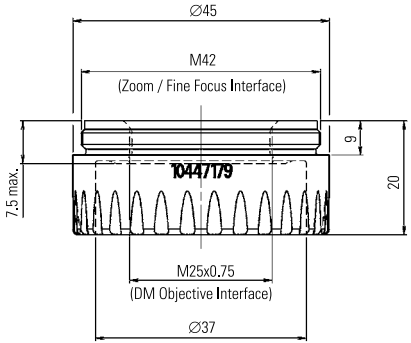


Tiltable focusing arm

Adapters

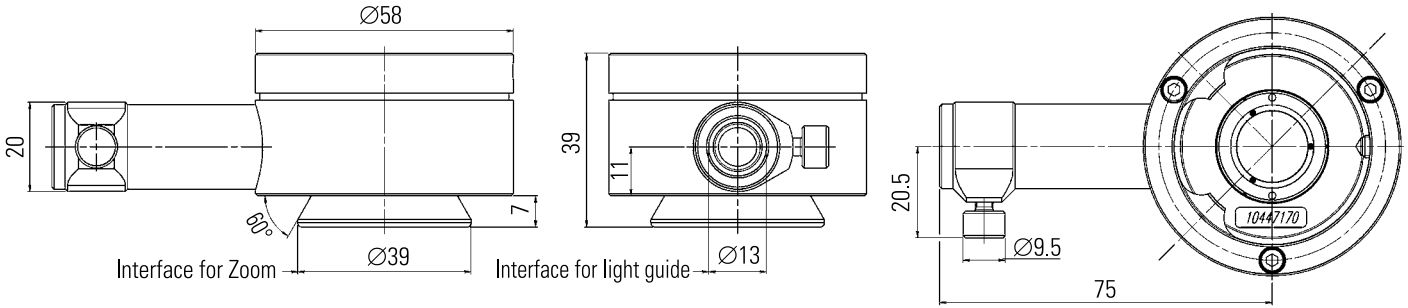


Adapter for achromatic objectives



Adapter for DM objectives

Coaxial incident-light housing



Specifications

Optical Data – Visual with Y Tube 1.25×

Objectives		1× planapochromatic		0.5× planapochromatic		0.8× planapochromatic		2× planapochromatic		5× planapochromatic	
Working distances		97 mm		187 mm		112 mm		39 mm		20 mm	
Eyepieces	Zoom position	Total mag. ×	Object field ∅ mm	Total mag. ×	Object field ∅ mm	Total mag. ×	Object field ∅ mm	Total mag. ×	Object field ∅ mm	Total mag. ×	Object field ∅ mm
10×/23B	0.57	7.1	32.3	3.6	64.6	5.7	40.4	14.3	16.1	35.6	6.5
	0.8	10	23.0	5	46.0	8	28.8	20	11.5	50	4.6
	1	12.5	18.4	6.3	36.8	10	23.0	25	9.2	62.5	3.7
	1.25	15.6	14.7	7.8	29.4	12.5	18.4	31.3	7.4	78.1	2.9
	1.6	20	11.5	10	23.0	16	14.4	40	5.8	100	2.3
	2	25	9.2	12.5	18.4	20	11.5	50	4.6	125	1.8
	2.5	31.3	7.4	15.6	14.7	25	9.2	62.5	3.7	156.3	1.5
	3.2	40	5.8	20	11.5	32	7.2	80	2.9	200	1.2
	3.6	45	5.1	22.5	10.2	36	6.4	90	2.6	225	1.0
	4	50	4.6	25	9.2	40	5.8	100	2.3	250	0.9
	5	62.5	3.7	31.3	7.4	50	4.6	125	1.8	312.5	0.7
	6.3	78.8	2.9	39.4	5.8	63	3.7	157.5	1.5	393.8	0.6
	8	100	2.3	50	4.6	80	2.9	200	1.2	500	0.5
	9.2	115	2.0	57.5	4.0	92	2.5	230	1.0	575	0.4

Optical Data – Visual with Y Tube 1.25× (cont'd.)

Objectives		1× planapochromatic		0.5× planapochromatic		0.8× planapochromatic		2× planapochromatic		5× planapochromatic	
Working distances		97 mm		187 mm		112 mm		39 mm		20 mm	
Eyepieces	Zoom position	Total mag. ×	Object field ∅ mm	Total mag. ×	Object field ∅ mm	Total mag. ×	Object field ∅ mm	Total mag. ×	Object field ∅ mm	Total mag. ×	Object field ∅ mm
16×/15B	0.57	11.4	21.1	5.7	42.1	9.1	26.3	22.8	10.5	57	4.2
	0.8	16	15.0	8	30.0	12.8	18.8	32	7.5	80	3.0
	1	20	12.0	10	24.0	16	15.0	40	6.0	100	2.4
	1.25	25	9.6	12.5	19.2	20	12.0	50	4.8	125	1.9
	1.6	32	7.5	16	15.0	25.6	9.4	64	3.8	160	1.5
	2	40	6.0	20	12.0	32	7.5	80	3.0	200	1.2
	2.5	50	4.8	25	9.6	40	6.0	100	2.4	250	1.0
	3.2	64	3.8	32	7.5	51.2	4.7	128	1.9	320	0.8
	3.6	72	3.3	36	6.7	57.6	4.2	144	1.7	360	0.7
	4	80	3.0	40	6.0	64	3.8	160	1.5	400	0.6
	5	100	2.4	50	4.8	80	3.0	200	1.2	500	0.5
	6.3	126	1.9	63	3.8	100.8	2.4	252	1.0	630	0.4
	8	160	1.5	80	3.0	128	1.9	320	0.8	800	0.3
	9.2	184	1.3	92	2.6	147.2	1.6	368	0.7	920	0.3
25×/9.5B	0.57	17.8	13.3	8.91	26.7	14.3	16.7	35.6	6.7	89	2.7
	0.8	25	9.5	12.5	19.0	20	11.9	50	4.8	125	1.9
	1	31.3	7.6	15.6	15.2	25	9.5	62.5	3.8	156	1.5
	1.25	39.1	6.1	19.5	12.2	31.3	7.6	78.1	3.0	195	1.2
	1.6	50	4.8	25	9.5	40	5.9	100	2.4	250	1.0
	2	62.5	3.8	31.3	7.6	50	4.8	125	1.9	313	0.8
	2.5	78.1	3.0	39.1	6.1	62.5	3.8	156	1.5	391	0.6
	3.2	100	2.4	50	4.8	80	3.0	200	1.2	500	0.5
	3.6	113	2.1	56.3	4.2	90	2.6	225	1.1	562	0.4
	4	125	1.9	62.5	3.8	100	2.4	250	1.0	625	0.4
	5	156	1.5	78.1	3.4	125	1.9	313	0.8	781	0.3
	6.3	197	1.2	98.4	2.4	158	1.5	394	0.6	984	0.2
	8	250	1.0	125	1.9	200	1.2	500	0.5	1250	0.2
	9.2	288	0.8	144	1.6	230	1.0	575	0.4	1438	0.2

Optical Data – Visual with Y Tube 1.25× (cont'd.)

Objectives		1× planapochromatic		0.5× planapochromatic		0.8× planapochromatic		2× planapochromatic		5× planapochromatic	
Working distances		97 mm		187 mm		112 mm		39 mm		20 mm	
Eyepieces	Zoom position	Total mag. ×	Object field ∅ mm	Total mag. ×	Object field ∅ mm	Total mag. ×	Object field ∅ mm	Total mag. ×	Object field ∅ mm	Total mag. ×	Object field ∅ mm
40×/6B	0.57	28.5	8.4	14.3	16.8	22.8	10.5	57	4.2	143	1.7
	0.8	40	6.0	20	12.0	32	7.5	80	3.0	200	1.2
	1	50	4.8	25	9.6	40	6.0	100	2.4	250	1.0
	1.25	62.5	3.8	31.3	7.7	50	4.8	125	1.9	313	0.8
	1.6	80	3.0	40	6.0	64	3.8	160	1.5	400	0.6
	2	100	2.4	50	4.8	80	3.0	200	1.2	500	0.5
	2.5	125	1.9	62.5	3.8	100	2.4	250	1.0	625	0.4
	3.2	160	1.5	80	3.0	128	1.9	320	0.8	800	0.3
	3.6	180	1.3	90	2.7	144	1.7	360	0.7	900	0.3
	4	200	1.2	100	2.4	160	1.5	400	0.6	1000	0.2
	5	250	1.0	125	1.9	200	1.2	500	0.5	1250	0.2
	6.3	315	0.8	158	1.5	252	1.0	630	0.4	1575	0.2
	8	400	0.6	200	1.2	320	0.8	800	0.3	2000	0.1
	9.2	460	0.5	230	1.0	368	0.7	920	0.3	2300	0.1

Leica Z6 APO & Z16 APO

	Leica Z6 APO	Leica Z16 APO
Zoom	6.3:1	16:1
Zoom factor	0.57× – 3.6×	0.57× – 9.2×
Built-in iris diaphragm	✔	✔
Engageable zoom positions	0.57 / 0.8 / 1 / 1.25 / 1.6 / 2 / 2.5 / 3.2 / 3.6	0.57 / 0.8 / 1 / 1.25 / 1.6 / 2 / 2.5 / 3.2 / 4 / 5 / 6.3 / 8 / 9.2
Zoom speed	–	–
Visual data with 1× planapochromatic objective / 10× eyepieces / 1.25× Y tube		
Magnification	7.1× – 45×	7.1× – 115×
Resolution	60 – 351 Lp / mm	51 – 336 Lp / mm
Visible structural width	8.3 – 1.4 µm	9.8 – 1.49 µm
Numerical Aperture	0.02 – 0.117 nA	0.017 – 0.112 nA
Object field ∅	32.3 mm – 5.1 mm	32.3 mm – 2.0 mm
Depth of field (diaphragm open)	3.1 mm – 0.09 mm	3.8 mm – 0.05 mm
Depth of field (dia. closed)	18.1 mm – 0.4 mm	18.4 mm – 0.4 mm
Visual data with 2× planapochromatic objective / 40× eyepieces / 1.25× Y tube		
Magnification	57× – 360×	57× – 920×
Resolution	120 – 702 Lp / mm	102 – 672 Lp / mm
Visible structural width	4.2 – 0.7 µm	4.9 – 0.74 µm
Numerical Aperture	0.04 – 0.234 nA	0.034 – 0.224 nA
Object field ∅	4.2 mm – 0.67 mm	4.2 mm – 0.26 mm
Data with Leica DFC490 digital camera / 1× planapochromatic objective / AS tube / 0.63× video objective		
Magnification Chip: Object	0.36× – 2.3×	0.36× – 5.8×
Digital resolution*	33.3 – 210 Lp / mm	33.3 – 336 Lp / mm
Object field projected onto chip	24.5 mm × 18.4 mm / 3.9 mm × 2.9 mm	24.5 mm × 18.4 mm / 1.5 mm × 1.14 mm
Depth of field (diaphragm open)	1.06 mm – 0.03 mm	1.4 mm – 0.03 mm
Depth of field (dia. closed)	10.7 mm – 0.26 mm	10.9 mm – 0.3 mm

Optical Accessories for Leica Z6 APO & Z16 APO

	Leica Z6 APO & Z6 APO
Objectives	• Planapochromat 1×, 2×, 0.8×, 0.5×, 5× • M series achromatic objectives 0.63×, 0.5×, 0.32×, lead-free 0.5×, 0.32×, lead-free
Working distances	• 187 mm (0.5× planapochromat) • 97 mm (1× planapochromat) • 112 mm (0.8× planapochromat) • 39 mm (2× planapochromat) • 19 mm (5.0× planapochromat)
Objective adapters	• For M series achromatic objectives • For 10× and 20× HR objectives • For 10× and 20× DM objectives
DM objectives (suitable for the upper zoom range only)	• DM objective N Plan L 20× / 0.40 corr • DM objective N Plan 10× / 0.25– / A5.8
Fine Focusing	10 mm travel, optional
Binocular tubes, ergonomics	• Inclined and straight binocular tubes • Apochromatic ErgoTube® 10° – 50° with synchronized interpupillary distance adjustment • Various ErgoModules® (optional)
Interpupillary distance	55 mm – 75 mm
Ergonomic wide-field eyepieces for persons wearing glasses	10× / 21, 16× / 14, 25× / 9.5, 40× / 6, distortion-free, attachable eyecups for protection from infection

ErgoTube® and ErgoModule® are registered in the United States Patent and Trademark Office

Ambient Conditions and Weights

Ambient operating conditions	
Ambient temperature	+10 °C to +40 °C
Rel. humidity	Up to 35 °C ambient temperature: 75%
Air pressure	700 – 1060 hPa
Transport and storage	
Temperature	-20 °C to +52 °C
Rel. humidity	10% – 95% (non-condensing)
Air pressure	500 – 1200 hPa

Weight		
10 447 174	Leica Z6 APO A zoom system	1.030 kg
10 447173	Leica Z16 APO A zoom system	1.330 kg
10 447 176	1× planapochromatic objective	0.150 kg
10 447 178	2× planapochromatic objective	0.270 kg
10 446 360	0.8× planapochromatic objective	0.170 kg
10 447 177	0.5× planapochromatic objective	0.170 kg
10 447 204	Video/phototube AS	0.120 kg
10 447 128	Video/phototube A	0.200 kg
10 447 109	Y tube	0.430 kg
10 447 196	Carrier for AS tube	0.340 kg

Leica TL ST Transmitted-light Base

Light source	Halogen lamp 12V/20W
Quick illuminant change	Yes
Illuminated area	50 mm
Power supply unit	Input voltage 100 – 240 V~, frequency 50 – 60 Hz energy consumption 30 W max., ambient temperature 10–40 °C
Connections	Power plug, power switch
Weight	7.4 kg

Illumination types

Bright field	Yes
Dark field	Yes (single-sided)
Oblique light	No
Relief Contrast System (RC™)	No
CCIC (Constant Color Intensity Control)	No
Internal shutter/lamp control	No
Integrated filter holder	Yes
Coated optics for increasing the color temperature	Yes
Matching of high num. aperture	No
Remote control options	No
AntiShock™ Pads	Yes
Dimensions (W×H×D)	340×430×85 mm

Leica TL BFDF Transmitted-light Base

Light source	External via cold light source
Illuminated area	40 mm
Connections	Connection for cold light guide, active f=10mm, end tube f=13mm
Weight	5.8 kg

Illumination types

Bright field	Yes
Dark field	Yes
Oblique light	No
Relief Contrast System (RC™)	No
CCIC (Constant Color Intensity Control)	No
Internal shutter/lamp control	Yes*
Integrated filter holder	No
Coated optics for increasing the color temperature	No
Matching of high num. aperture	Yes**
Remote control options	Yes***
AntiShock™ Pads	Yes
Dimensions (W×H×D)	340×390×90 mm

*With cold light source Leica CLS150 LS **Concave mirror *** With external light source

Leica TL RC™ / TL RCI™

	Leica TL RC™	Leica TL RCI™
Light source	External via cold light source	Halogen lamp 12V/20W
Quick illuminant change	–	Yes
Illuminated area	35 mm	35 mm
Power supply unit	–	100 – 240 V~, frequency 50 – 60 Hz energy consumption 30 W max., ambient temperature 10–40 °C
Connections	Connection for cold light guide, active f=10mm, end tube f=13mm	1×USB type A, 1×USB type B, 2×CAN-BUS
Weight	6.0 kg	7.2 kg

Illumination types

Bright field/dark field	Yes/yes	Yes/yes
Oblique light/Relief Contrast System (RC™)	Yes/yes	Yes/yes
CCIC (Constant Color Intensity Control)	No	Yes
Internal shutter/lamp control	Yes**	Yes
Integrated filter holder	Yes	Yes
Coated optics for increasing the color temperature	Yes	Yes
Matching of high num. aperture	Yes***	Yes***
Remote control options	Yes****	Yes
AntiShock™ Pads	Yes	Yes
Dimensions of base (W×H×D)	340×390×95 mm	340×440×95 mm

*Single-sided **With cold light source Leica CLS150 LS ***Concave mirror ****With external light source

Leica IsoPro™ Motorized XY Stage

Compatibility	Leica incident-light and TL bases (TL BFDF, TL RC™, TL RCI™)
Stage size (L × W × H)	335.5 mm × 370 mm × 41.5 mm
Travel	152 mm × 102 mm (6" × 4")
Speed X,Y	30 mm/s
Motor resolution X,Y	0.25 µm
Repeatability X, Y	± 2 µm
Positioning accuracy X,Y	±20 µm over the entire positioning range
Hysteresis X, Y	30 µm
Motor	Direct current (DC) motor with encoder
Backlash	Slack-free
Adapter	All adapters for TL bases
Acceleration	S-shaped acceleration
Computer connection	USB
Control options	Leica PSC™, Leica Smart Move, Leica LAS via PC
Power supply	Input: 100–240 VAC 50 / 60 Hz 1.0 A Output: 15 VDC 2.66 A 40W max.

Appendix

Calculating the Total Magnification and Field of View Diameter

Parameter	
MO	Magnification of the objective
ME	Magnification of the eyepiece
z	Magnification of the changer position
q	Tube factor, e.g. 1.5× for coaxial incident light, 1.6× for 45° ErgoTube™
r	Factor of 1.25× when using video/phototube Y
NFOV	Field number of the eyepiece. Field numbers are printed on the eyepieces: 10× = 21, 16× = 14, 25× = 9.5, 40× = 6.

Example	
MO	1× objective
ME	25×/9.5 eyepiece
z	Zoom position 4
q	Coaxial incident light 1.5×, tube factor
r	Factor 1.25×

Calculation example: Magnification in the binocular tube:

$$M_{TOT\,VIS} = M_O \times M_E \times z \times q \times r$$

or

$$1 \times 25 \times 4 \times 1.5 \times 1.25 = 187.5\times$$

Calculation example: Field of view diameter in the specimen

$$\varnothing\ \text{OF:} \quad \frac{N_{FOV}}{M_O \times z \times q \times r}$$

Care, Maintenance, Contact Persons

We hope you enjoy using your high-performance macroscope. Leica macroscopes are renowned for their robustness and long service life. Observing the following care and cleaning tips will ensure that even after years and decades, your Leica macroscope will continue to work as well as it did on the very first day.

Warranty benefits

The warranty covers all faults in materials and manufacture. It does not, however, cover damage resulting from careless or improper handling.

Contact address

However, if your instrument should no longer function properly, contact your technician, your Leica representative or Leica Microsystems (Switzerland) AG, CH-9435 Heerbrugg.

E-mail contact:

stereo.service@leica-microsystems.com

Care

- ★ Protect your macroscope from moisture, fumes and acids and from alkaline, caustic and corrosive materials and keep chemicals away from the instruments.
- ★ Plugs, optical systems and mechanical parts must not be disassembled or replaced, unless doing so is specifically permitted and described in this manual.
- ★ Protect your macroscope from oil and grease.
- ★ Do not grease guide surfaces or mechanical parts.

Care, Maintenance, Contact Persons (cont'd.)

Protection from dirt

Dust and dirt will affect the quality of your results.

- ★ Put a dust cover over the macroscope when it will not be used for a long time.
- ★ Use dust caps to protect tube openings, tubes without eyepieces, and eyepieces.
- ★ Keep accessories in a dust-free place when not in use.

Cleaning polymer components

Some components are made of polymer or are polymer-coated. They are, therefore, pleasant and convenient to handle. The use of unsuitable cleaning agents and techniques can damage polymers.

Permitted measures

- ★ Clean the macroscope (or parts of it) using warm soapy water, then wipe using distilled water.
- ★ For stubborn dirt, you can also use ethanol (industrial alcohol) or isopropanol. When doing so, follow the corresponding safety instructions.
- ★ Remove dust with a pneumatic rubber bulb or with a soft brush.
- ★ Clean objectives and eyepieces with special optic cleaning cloths and with pure alcohol.